

# Self-Biased Radiation Hardened Ka-Band Circulators for Size, Weight and Power Restricted Long Range Space Applications, Phase I

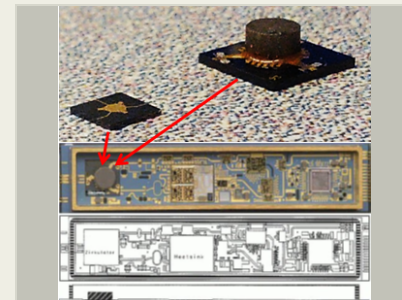
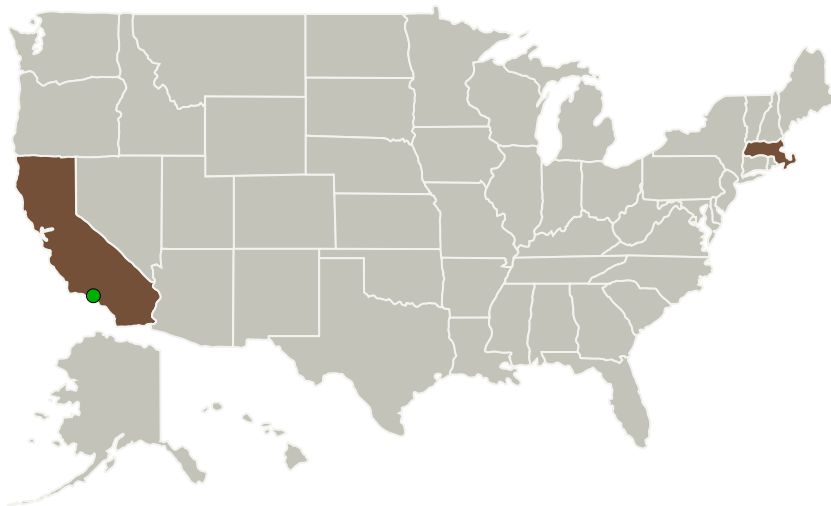
Completed Technology Project (2013 - 2013)



## Project Introduction

Ferrite control components including circulators and isolators are fundamental building blocks of Transmit/Receive modules (TRM) utilized in high data rate active space transceivers and transponders for both long-range (LR) and low earth orbit (LEO) systems. These components are utilized to protect high power amplifiers (HPA) during the transmit cycle from destabilizing, and potentially harmful, power reflections from the antenna element. During receive cycle these components are utilized to direct lower power received signals with minimal attenuation to the low noise amplifiers (LNA). As such, performance specifications of these ferrite control components, such as bandwidth, insertion loss, isolation, power handling, temperature stability, radiation hardness, and linearity impose strict limitations on the overall system performance. Over the course of the proposed Ph1 SBIR program self-biased ferrite control components based on highly textured hexagonal ferrite compacts which have the potential to eliminate biasing magnets and significantly reduce the size, cost, and weight of the TRM while concurrently increasing power handling capability, and improving temperature stability and radiation hardness will be investigated. Specifically, a research and development path to realizing high performance self-biased ferrite materials and device designs for operation in space based environments at Ka-band (>27 GHz, 31.5 - 34 GHz targeted) is outlined.

## Primary U.S. Work Locations and Key Partners



Self-Biased Radiation Hardened Ka-Band Circulators for Size, Weight and Power Restricted Long Range Space Applications

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Organizations Performing Work	Role	Type	Location
Metamagnetics, Inc.	Lead Organization	Industry Veteran-Owned Small Business (VOSB)	Canton, Massachusetts
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

## Primary U.S. Work Locations

California	Massachusetts
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## Project Transitions

**May 2013:** Project Start**November 2013:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140425>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Metamagnetics, Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

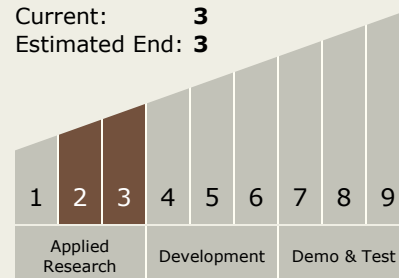
Andrew Daigle

## Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3

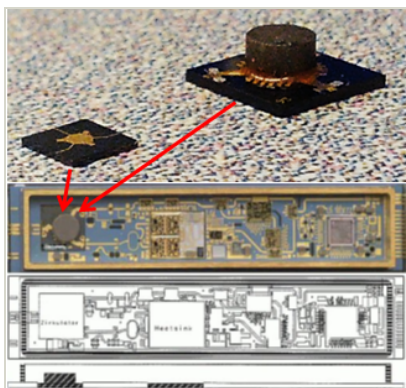


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## Images



### Project Image

Self-Biased Radiation Hardened Ka-Band Circulators for Size, Weight and Power Restricted Long Range Space Applications

(<https://techport.nasa.gov/image/127196>)

## Technology Areas

### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - └ TX05.2 Radio Frequency
    - └ TX05.2.4 Flight and Ground Systems

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System